

# PATENT COOPERATION TREATY

## PCT

From the INTERNATIONAL SEARCHING AUTHORITY

To:  
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INVITATION TO PAY ADDITIONAL FEES

(PCT Article 17(3)(a) and Rule 40.1)

Applicant's or agent's file reference <b>00884.319W01</b>	Date of mailing (day/month/year) <b>25/03/2002</b>
International application No. <b>PCT/US 01/26902</b>	PAYMENT DUE within <b>45</b> <del>XXXX</del> days from the above date of mailing
International filing date (day/month/year) <b>29/08/2001</b>	
Applicant <b>INTEL CORPORATION</b>	

D/May 9, 2002

1. This International Searching Authority

- (i) considers that there are 2 (number of) inventions claimed in the international application covered by the claims indicated ~~XXXX~~ on the extra sheet:

and it considers that the international application does not comply with the requirements of unity of invention (Rules 13.1, 13.2 and 13.3) for the reasons indicated ~~XXXX~~ on the extra sheet:

- (ii) ☒ has carried out a partial international search (see Annex) ☐ will establish the international search report on those parts of the international application which relate to the invention first mentioned in claims Nos.:

**1-5, 8-14, 17-26**

- (iii) will establish the international search report on the other parts of the international application only if, and to the extent to which, additional fees are paid

2. The applicant is hereby invited, within the time limit indicated above, to pay the amount indicated below:

$$\frac{\text{EUR } 945,00}{\text{Fee per additional invention}} \times \frac{1}{\text{number of additional inventions}} = \frac{\text{EUR } 945,00}{\text{total amount of additional fees}}$$

Or, \_\_\_\_\_ x \_\_\_\_\_ = \_\_\_\_\_

The applicant is informed that, according to Rule 40.2(c), the payment of any additional fee may be made under protest, i.e., a reasoned statement to the effect that the international application complies with the requirement of unity of invention or that the amount of the required additional fee is excessive.

3. ☐ Claim(s) Nos. \_\_\_\_\_ have been found to be unsearchable under Article 17(2)(b) because of defects under Article 17(2)(a) and therefore have not been included with any invention.

Name and mailing address of the International Searching Authority



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**Gennaro Cappiello** MAR 28 2002

RECEIVED

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. Claims: 1-5, 8-14, 17-26

An assembly for a die comprising a lid and a solderable thermally conductive element to couple the die to the lid

2. Claims: 6, 7, 15, 16, 27-30

A die comprising at least one metal layer to which the solderable thermally conductive element can be coupled to the lid

The special technical feature of the first invention comprises an assembly for a die having a lid and a solderable thermally conductive element coupling the die to the lid. The use of a highly conductive solder material as a thermal interface between the die and the lid (heat spreader) avoids many problems associated with prior art packaging of integrated circuits, like for example resin separation, outgassing or delamination when a polymeric material is used as a thermal interface. Also thermal stress can be minimized when a low melting point solder is used as a thermal interface.

The general problem underlying this invention is neither novel, because a solution to it has already been given nor does the solution given involve any inventive step regarding the state of the art' as illustrated by document US-A-6091603 (see col. 4, lines 16-27; col. 5, line 8 - col. 6, line 18; figure 4A).

The special technical feature of the second invention comprises a die having at least one metal layer on the die surface to which the solderable thermally conductive element can be coupled. To improve solderability of the thermal interface to the die and to prevent possible delamination of the thermal interface from the die one or more metal layers, like adhesion, diffusion barrier and/or wetting layers, are deposited on the die surface.

The special technical features of the two inventions are so different, that they cannot be seen as an embodiment of a single inventive concept. Therefore the application does not meet the requirements of rule 13.1 of the PCT.

Annex Form PCT/ISA/206  
COMMUNICATION RELATING TO THE RESULTS  
OF THE PARTIAL INTERNATIONAL SEARCH

International Application No  
PCT/US 01/26902

1. The present communication is an Annex to the invitation to pay additional fees (Form PCT/ISA/206). It shows the results of the international search established on the parts of the international application which relate to the invention first mentioned in claims Nos. 1-5, 8-14, 17-26
2. This communication is not the international search report which will be established according to Article 18 and Rule 43.
3. If the applicant does not pay any additional search fees, the information appearing in this communication will be considered as the result of the international search and will be included as such in the international search report.
4. If the applicant pays additional fees, the international search report will contain both the information appearing in this communication and the results of the international search on other parts of the international application for which such fees will have been paid.

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6 091 603 A (DAVES GLENN G ET AL) 18 July 2000 (2000-07-18)  column 4, line 16 - column 6, line 18; figure 4A  ---	1-5, 8-14, 17-26
X	US 4 561 011 A (KOHARA MASANOBU ET AL) 24 December 1985 (1985-12-24)  column 2, line 16 - line 55; figures 5, 14 column 6, line 19 - line 40  ---	1, 3, 8, 9, 11, 13, 17-19, 21-23
X	A. AMENDOLA, C.A. PECK AND C. PRASAD: "COOLING STRUCTURE FOR AN INTEGRATED CIRCUIT MODULE" IBM TECHNICAL DISCLOSURE BULLETIN., vol. 23, no. 2, July 1980 (1980-07), page 602 XP002191051 IBM CORP. NEW YORK., US ISSN: 0018-8689 the whole document  ---	1, 4, 8, 9, 11, 17, 18, 21, 23
A	the whole document  --- -/--	3, 13, 19, 22

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

\* Special categories of cited documents:

- \* "A" document defining the general state of the art which is not considered to be of particular relevance
- \* "E" earlier document but published on or after the international filing date
- \* "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- \* "O" document referring to an oral disclosure, use, exhibition or other means
- \* "P" document published prior to the international filing date but later than the priority date claimed

- \* "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- \* "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- \* "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- \* "&" document member of the same patent family

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	R.C.MILLER: "Structure for achieving thermal enhancement in a semiconductor package" IBM TECHNICAL DISCLOSURE BULLETIN., vol. 23, no. 6, November 1980 (1980-11), page 2308 XP002191052 IBM CORP. NEW YORK., US ISSN: 0018-8689	1,4,5,8, 9,11,12, 17,18, 21,23
A	the whole document	3,13,19, 22
X	----- PATENT ABSTRACTS OF JAPAN vol. 015, no. 365 (E-1111), 13 September 1991 (1991-09-13) -& JP 03 142860 A (HITACHI LTD), 18 June 1991 (1991-06-18) the whole document -----	1,4,8,9, 11,17, 18,21

**Patent Family Annex**  
Information on patent family members

International Application No  
**PCT/US 01/26902**

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 6091603	A	18-07-2000	CN 1290961 A	11-04-2001
US 4561011	A	24-12-1985	JP 1450754 C	11-07-1988
			JP 59065457 A	13-04-1984
			JP 62059888 B	14-12-1987
			JP 1450755 C	11-07-1988
			JP 59065458 A	13-04-1984
			JP 62059887 B	14-12-1987
			US 4654966 A	07-04-1987
JP 03142860	A	18-06-1991	NONE	